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STYLASTERIDAE (HYDROCORALS) FROM
SOUTHERN SEAS

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(Plates II-IV, Text-figs. 1-12)

SPECIMENS of Stylasterids (Hydrocorals) have been taken by the ships of the Discovery Investigations at only a few stations. The Stylasteridae are on the whole comparatively scantily represented in collections of deep-sea expeditions, because in localities favourable to their growth the nature of the bottom makes collecting difficult.

Nevertheless, the Discovery material is very interesting both from a taxonomic point of view, containing as it does a peculiar new genus and two hitherto undescribed species, and also from the zoogeographical data supplied by the localities. From two of the stations so much material was collected that some impression of variation in the species *Errina antarctica* (Gray) can be obtained. This species is evidently widely distributed in antarctic-subantarctic waters.

Errina (*Eu-Errina*) *antarctica* (Gray, 1872)

(Pl. II, fig. 1; Pl. IV, figs. 3-6)

Porella antarctica Gray, *Proc. Zool. Soc. Lond.* 1872, p. 746, pl. 64, fig. 4.

Labiopora antarctica Moseley, *Philos. Trans.* 1878, vol. 169, pp. 476, 480. Ridley, *Proc. Zool. Soc. Lond.* 1881, p. 105.

Errina gracilis von Marenzeller, *Rés. Voy. Belgica, Rapp. Sci., Zool. Anvers*, 1903, p. 4, pl. i, figs. 1-4.

Errina antarctica Hickson, *Proc. Zool. Soc. Lond.* 1912, p. 887. Hickson, *Bull. Mus. Hist. Nat. Paris*, 1912, p. 2 (462).

Broch, *Sk. d. Norske Vid.-Akad. Oslo*, I. Mat.-Naturv. Kl. 1942, no. 3, p. 42, figs. 11, 12, pl. iv, fig. 12.

St. 652. Burdwood Bank, 54° 04' S, 61° 40' W, 169-171 m. Net badly torn (hard bottom).

St. 1948. 60° 49.4' S, 52° 40' W, 490-610 m.

St. 2200. Between Young and Sturge Is., Balleny Group, 67° 09.6' S, 163° 27.7' E, 532-512 m.

St. 2215. Off Antipodes Is., 49° 45.6' S, 178° 48' E, 163-210 m.

St. 2290. Off Falkland Is., 52° 16.6' S, 58° 06.8' W, 137-133 m.

The colonies of *Errina antarctica* are in most cases rather coarse and heavily built, fan-shaped with a distinct anterior and posterior side, the latter with none or only very few pores. The distal branchlets have numerous pores and spines on all sides (see Pl. II, fig. 1), but the spines tend to diminish and disappear on the posterior side, which may be naked and all but poreless already some 1 cm. from the top. The terminal branchlets carry spines on all sides and are cylindrical. They are differentiated into a zooid-bearing anterior and a naked posterior side, with more or less pronounced flattening of the branch, which in transverse section becomes more obviously oval, its greater diameter lying in the plane of the fan. In the basal parts of larger colonies spines and zooids disappear also on the anterior face of the main branches and stem. In many cases basal parts of the stem and main branches, where pores have disappeared, grow so broad that they coalesce into one flat basal stem or trunk.

It must be noted that the colonies may be partly incrusting. Whether a colony can spread over a large area cannot be answered with certainty, but part of a colony from the Burdwood Bank apparently has a horny black axis, because the hydrocoral has grown around the axis of a dead gorgonid and from this part real branches arise (Pl. II, fig. 1).

The material from Sts. 2200 and 2290 is especially rich, indicating the range of variation in the species.

The colony from the Burdwood Bank is on the whole very coarsely constructed like the colonies from St. 2200 (Pl. IV, figs. 3, 4 and 6). Colonies which are comparatively heavily built are almost always rather regularly flabellate, sometimes also a little incurved on the anterior side. On the other hand, colonies of more delicate construction and with marked ramification in many cases exhibit a more irregular growth and tend to have a more bushy appearance, although a main plane can still be distinguished (also from St. 2200, Pl. IV, fig. 5). An excellent figure of this type has been given by von Marenzeller (1903, pl. i, fig. 1) in his description of *E. gracilis*.

The branching is dichotomous or subdichotomous. However rich the branching may be, anastomoses are very seldom found.

The *colour* of the colony (in spirit) varies from a vivid brilliant carmine or brick red to almost white or yellowish, or occasionally light brown. Dead colonies may be greyish white, but very soon they attain a dark dull brown colour, probably owing to the attack of foreign micro-organisms. (Dead colonies are of course also exposed to attacks of boring animals. In living colonies, sections have revealed the occurrence of small, parasitic crustaceans lodged in 'ampullae', evidently caused by the parasites, but not visible to external examination. The identity of the crustaceans has not been established.)

The surface of the coenosteum after cleaning with sodium hypochlorite generally exhibits the peculiarly reticulated structure reminiscent of a lump of sugar; but in some colonies the structure is more vermiculated and feebly glossy. The differences are so small and gradual that they cannot be regarded as of taxonomic importance.

In a previous paper (1942) I distinguished provisionally a form *kerguelensis* from the typical form from Cape Horn. The scanty material suggested small differences in the surface structure of the coenosteum which, however, fell well within the range of variation. Another small difference was observed in the *gastrostyles*, which in the Cape Horn specimen were more slender and spine-like. This, however, must be looked on as an anomaly. Several *gastrostyles* from different colonies have been examined, and in the main they coincide with the fir-cone-like *gastrostyles* of the Kerguelen colony (1942, fig. 12), which are characteristic of *E. antarctica*. On the other hand, *E. spongiosa* Broch, 1942 may exceptionally show some external likeness to the coarsest colonies of *antarctica*.

Among the features separating these two suggested forms of *E. antarctica* the *ampullae* were also mentioned. In the Cape Horn specimen they protrude 'almost hemispherically on the surface', whereas in the Kerguelen fragment they 'are not visible on the surface of the branchlet', although belonging to the superficial layers of the coenosteum. Both fragments were from dried specimens, and it was not possible to ascertain the sex; however, I hinted that possibly the Cape Horn specimen might be a female.

In the present abundant material, several colonies occur in which ampullae cannot be seen externally, whereas in others they are very obvious, protruding like sections of a ball, and, moreover, in vividly red-coloured specimens they are emphasized by a yellow or whitish colour. Fractures reveal, however, that ampullae are present in great numbers in the peripheral layers of the coenosteum of the first-mentioned colonies. An investigation of the contents reveals that these colonies are males, whereas those with protruding ampullae are females.

All earlier descriptions have been based on dried specimens, and I took the opportunity to examine the soft parts in the rich material to hand.

The *gastropolyps* have from three to six (mostly four) small, thread-shaped tentacles, which exhibit pronounced extension and contraction.

In *antarctica* as well as in some other *Errina* species the dactylopores are of two types, viz. the niche- or slit-like dactylopores (grooves) of the grooved spines, and the small circular pores of the coenosteum

between the spines. In the terminal branches all intermediate stages occur (see Broch, 1942, p. 44), and von Marenzeller (1903) was accordingly inclined to consider the small pores only as developmental stages of the larger pores of the spines. It is impossible from examination of dried specimens alone to solve this question or to determine whether a real dimorphism exists. But investigation of the soft parts shows that the dactylozooids also exhibit a dimorphic development correlated with the type of pore. The dactylozooids inhabiting the simple pores of the coenosteum are digitiform (Fig. 1) and lack a specially developed basal adhesive part attached to the bottom or wall of the pore. The dactylozooids of the 'large pores', or grooves of the spines on the other hand, have a long basal segment attached to the wall of the lower part of the groove and the outer part of the adjoining pore, the digitiform, free part of the dactylozooid arising from the middle of the basal segment (Fig. 2). In the Discovery specimens the contracted free part is shorter than the basal segment, and it is impossible to judge of its length when extended. We must, however, presume that its powers of extension are rather large.

Thus it appears that a real dimorphism exists among the dactylozooids of *E. antarctica* correlated with the dimorphic development of the dactylopores.

The *male* ampullae contain a few gonophores (generally three) in different stages of development. When one gonophore is quite ripe and about to discharge its contents, the smallest (third) gonophore is only a rudimentary bud. No blastostyle can be detected in the ampulla. In this respect *E. antarctica* obviously differs from *E. spongiosa* Broch, 1942. The spadix of the male gonophore varies somewhat in shape, but always seems to be branched. In some cases it forms a very primitive 'trophodisc', whereas in other cases it is bi- or trifurcate, with the branchlets embedded in the contents of the gonophore.

The *female* ampulla only contains one gonophore. In those ampullae which were either empty or contained planula larvae about to escape, no secondary gonophores were seen. This may of course be a chance observation. The ripe ovum rests on a slightly hollowed bowl-shaped trophodisc, which in structure is intermediate between the trophodiscs of *Stylaster roseus* and *S. gemmascens* (Broch, 1942).

It is evident from the general characteristics of the colonies and the coenosteum that *Errina gracilis* (von Marenzeller, 1903) is a synonym of *E. antarctica*, and there is no reason to distinguish a form *keruelensis* (Broch, 1942) as distinct from the typical form of the species.

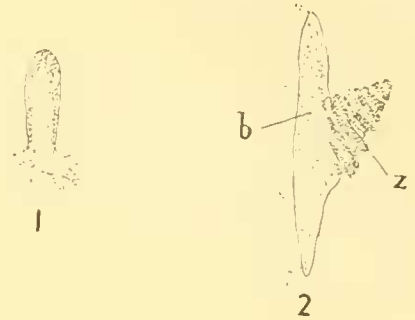
Errinopsis reticulum n.gen., n.sp.

(Pl. II, fig. 2; Pl. III, figs. 1, 2)

St. WS 246. South of Falkland Is., 52° 25' S, 61° 00' W, 208-267 m. Coarse green sand and pebbles.

The Discovery material consists of four colonies, luxuriant but not quite intact, and several fragments (probably broken away from the peripheral parts of the colonies). The largest colony, a splendid specimen with the greater transverse diameter measuring 32 cm. and a height of 25 cm. (the basal part with the attachment to a support has been broken away) is dried, consequently the two colonies next in size, one male and one female, which have been preserved in alcohol, have been selected as type specimens. They are reproduced in Pl. II, fig. 2, and Pl. III, fig. 1.

As indicated by the specific name *reticulum*, the colonies throughout have the appearance of a simple or complex fan, built up of a coarse network or filigree of anastomosing branches. Along the periphery



Figs. 1, 2. *Errina antarctica* from St. 652. (1) Simple, digitiform dactylozooid from pore between the spines. (2) Dactylozooid from the groove of a spine; the digitiform, free part of the zooid (z) arises from the middle of a large, adhesive basal part (b). $\times 80$.

of the colony, where branchlets bud, the terminal parts of the branchlets very soon touch and also coalesce to form new meshes. Terminal branchlets may have a diameter of only about 1 mm., but they soon grow thicker, and the diameter of the branches generally increases to 3–4 mm., in some cases even to about 5 mm. The meshes commonly have diameters of some 3–8 mm., and the size of the meshes is fairly constant in older parts of the colony. During growth the branches become oval in transverse section, the greater diameter being perpendicular to the main plane of the flabellum. In older parts of large colonies the greater diameter may often exceed twice the shorter diameter in length.

Accessory fans are common in older colonies. Such secondary fans diverge more or less strongly from the plane of the mother fan and are attached to the latter along the greater part of one side. In some cases a secondary fan may attach itself by its entire periphery to the mother fan, so that a closed 'basket' is formed, generally with finer meshes than in other parts of the old colony. The photographs on Pl. II, fig. 2 and Pl. III, fig. 1, convey the general features more clearly than any description.

The largest dried colony has a continuous accessory fan formation along the entire lateral and upper peripheral part, and the colony appears about to split along a line some 3–7 cm. within the margin into two somewhat diverging fans.

Under the microscope the surface of the colony gives a general impression of being finely reticulated. However, when cleaned with sodium hypochlorite the coenosteum becomes rather glossy, and its surface then exhibits a more vermiculated structure strongly reminiscent of a fingerprint (Pl. III, fig. 2). In places this vermiculated structure, owing to greater irregularities in the lines, presents a more reticulated appearance, but in all cases the surface keeps its semi-glossy character and does not give the 'lump of sugar' impression of the *Eu-Errina* species described by Broch in 1942.

The internal structure of the coenosteum is almost homogeneous, approaching to a certain degree the compact porcellaneous consistency of the *labiata* group of *Errina*. On the other hand, the central part with somewhat thicker branches is lighter in colour than the peripheral layers, and in some cases the axial part is all but white. In accordance with the comparatively porcellaneous appearance, the coenosteum is rather hard, and grinding is not so easy as in most of the *Eu-Errina* species. It must be added that there are no coarser canals in the oldest and thickest branches.

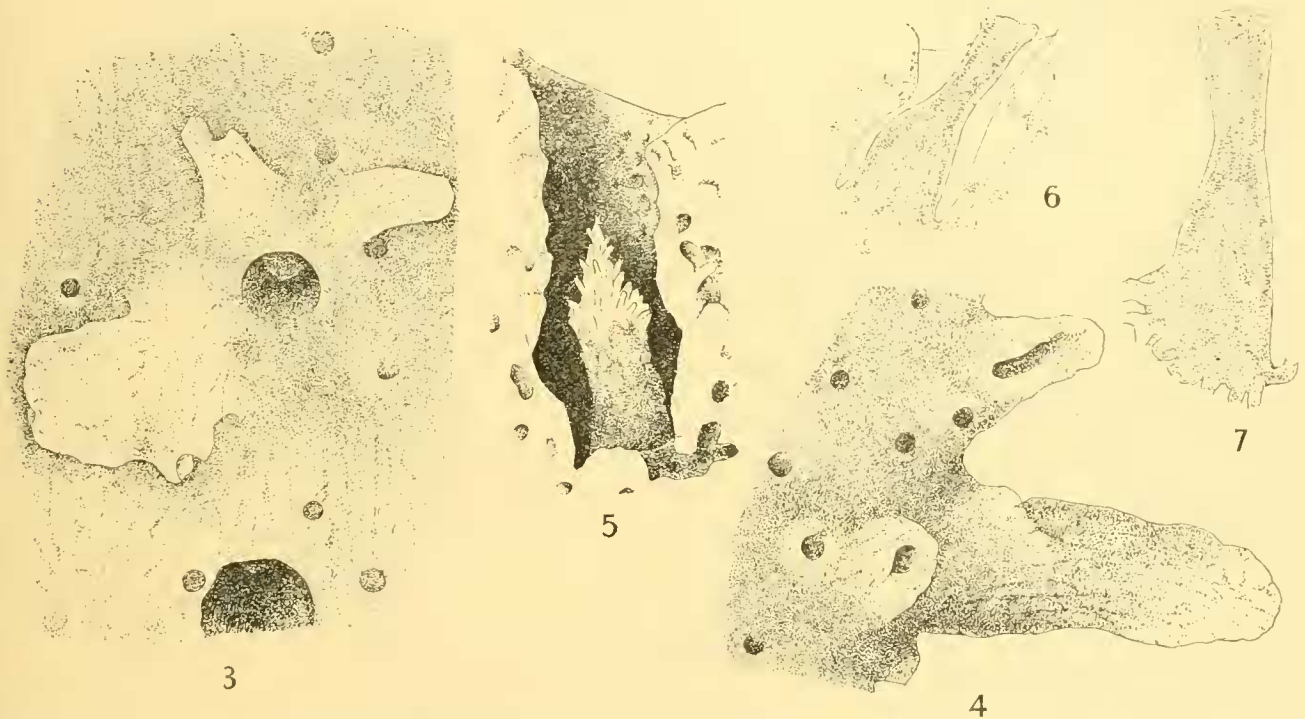
No correlation between the position of gastropores and dactylopores can be traced. The *gastropores* are rather small, their diameter at the opening measuring only 0.3–0.4 mm. The pores are also not particularly deep, and the well-developed gastrostyle is easily observed externally in colonies cleaned with sodium hypochlorite (Fig. 3). The gastrostyle (Fig. 5) resembles a pine cone with rather bristling scales, although it is comparatively compactly constructed. The cone is placed on top of a fairly high pedicle with smooth walls. Occasionally a gastrostyle was observed having an almost needle-shaped prolongation of the apical part of the cone.

It is impossible to discern any regularity in the distribution of the gastropores in peripheral free branchlets. In older branches, on the other hand, the great majority of gastropores are found along the lateral sides facing the meshes, whereas the anterior and the posterior sides of the branches (the flabellum) have only a few gastropores. The numbers are also smaller on the posterior than on the anterior side of the colony.

It has already been mentioned that no regular correlation between gastropores and *dactylopores* can be traced. Nevertheless, from one to three or four spines are almost always formed at the opening of the gastropore, each spine with one or more dactylopores (Fig. 3). In some cases such spines are wanting, and in others dactylopores occur in great numbers between the spines and independent of them. On the peripheral branchlets spines are numerous and equally developed on all sides. When the branchlets grow thicker, the spines seem to diminish, or to disappear little by little, first on the posterior and subsequently on the anterior side of the colony. Along the sides of the meshes, however, spines

are present also in older parts of the colonies, although they are more prominent on the thinner, apical or peripheral, branchlets than on more central branches of the meshwork (Pl. II, fig. 2; Pl. III, fig. 1). These features seem to indicate that the spines are gradually absorbed by the growth of the surrounding coenosteum, and that they do not grow materially after the incorporation of the branchlet in the meshwork of the colony.

At first glance we might presume dimorphism to exist among the dactylopores, small dactylopores being found as circular holes in the coenosteum in great numbers between the spines (Figs. 3, 4). On the other hand, it is obvious that the spines do not quite correspond either to the nariform or the water-spout-like spines of *Errina*. In their disposition, especially on the branchlets, they are reminiscent of the nariform spines of *Eu-Errina*, but it is also evident that they are connected with, or probably



Figs. 3-7. *Errinopsis reticulum* from St. WS 246. (3) Part of the surface of a branch; near the brim of the central gastropore three 'spines' are seated, the lumpy one with two grooves or conduits from base to summit. (4) Lateral part of a branchlet with full-grown and developing spines. (5) Gastropore from the fracture of a branch showing the entire gastrostyle in side view. (6) Gastropolyp *in situ* drawn on basis of two slides. (7) Gastropolyp prepared out. (1), (2) and (3) after skeleton having been cleaned with sodium hypochlorite; (4) and (5) from decalcified fragments. (1) $\times 40$; (2)-(5) $\times 60$.

developed from, spineless pores by growth of the surrounding coenosteum (Fig. 4). The growth is not symmetrical, but at first results in a spine with an obliquely placed, oval pore-opening. In many cases the apical part of the spine grows far above the pore, so that this becomes an oval opening or slit on the side of a conical spine. In other cases the pore continues as a groove or narrow conduit to the very top of the spine. Again, two or three pores may debouch on one spine, and here one may be round, the other more groove-like. In Fig. 3 the lumpy spine is furnished with two grooves, both of which run conduit-like to the very summit of the 'spine'.

A careful examination of the coenosteum alone does not furnish a safe basis for determining whether the dactylopores exhibit real dimorphism. This question can only be settled by examination of the soft parts of the colony.

The *dactylozooids* are throughout simply finger-shaped without any specially developed basal adhesive part; they agree entirely with the smaller *dactylozooids* of *E. antarctica* (Fig. 1). The uni-

formity of the dactylozooids and the many intermediate forms bridging the differences between simple and spiniferous pores furnish evidence that dimorphism does not exist.

The small *gastropolyps* (Figs. 6, 7) are tubular and have four to six rudimentary small tentacles which are exceedingly difficult to trace in contracted specimens.

Both male and female colonies are found in the Discovery material. The male colony (Pl. II, fig. 2) is much lighter coloured than the female (Pl. III, fig. 1). This, however, may be fortuitous. On the other hand, although the male ampullae are placed rather superficially on the branches, there is no external indication of their presence, whereas the female ampullae are generally marked by lighter coloured or whitish spots on the branch or, in many cases, also by feeble swellings. Nevertheless, the ampullae do not show as protuberances among the pores or spines.

The *male* ampulla contains two to four gonophores, one of which may be fully ripe, whereas the second is less advanced in its development, the other gonophores being very small or quite rudimentary. In half-ripe gonophores, where the spadix attains its greatest development, the spadix is saucer-shaped with a small varying number of pouches or lobes, i.e. it is a simplified 'trophodisc'. The gonophores bud from the basal part of a finger-shaped blastostyle similar to that observed in *Distichopora violacea* (England, 1926) or *Errina spongiosa* (Broch, 1942), the agreement with the latter being especially marked.

While the male ampulla does not generally exceed 0.5 mm. in diameter, the ripe *female* ampulla has a diameter of about 1 mm. or even a little more. As a rule only one ovum develops at a time in the ampulla. No detailed study of the development of the gonophores was made, but they do not appear to differ from the common types of gonophores among Stylasteridae (Broch, 1942).

The present species cannot be assigned to any previously described form among the Stylasteridae. The irregular distribution of gastropores and dactylopores proves that it belongs to the subfamily Sporadoporidae, and the spines connected with several of the dactylopores, together with the arrangement of these spines in terminal parts of the branches, suggest the genus *Errina*. However, a thorough examination of the spines reveals that they differ from the regular spine types of *Errina*, from both the nariform spines of *Eu-Errina*, and from the 'waterspouts' of *Labiata* (Broch, 1942).

Above all, the colony is rather aberrant in its mode of growth. In some species of *Errina* various authors have emphasized the occurrence of more or less incidental anastomoses between adjacent branches of the colonies and used this as a specific characteristic. In the present species it is difficult to detect a free branchlet even at the periphery of the net-like colony, and the growth form of the new species seems to occupy a position among the Stylasteridae similar to that of the *Retepora* colonies among the Bryozoans. It is accordingly reasonable to regard this mode of growth and branching as a generic character, a point of view which to a certain degree is strengthened by the features of the spines and their above-mentioned independence of special dactylopores and dactylozooids. It is probable that the latter character should be more properly regarded as a specific feature. To settle this question, however, comparison with other related species is needed.

Hence the specimens can be regarded as the representative—and type—of a new genus,

Errinopsis n.g.,

the characteristics of which at present coincide with the genotype:

Errinopsis reticulum n.sp.

Colony simple or composite flabelliform, the branches anastomosing to form a regular, fine mesh-work. Gastropores and dactylopores irregularly scattered on all sides of the terminal branchlets; in older parts of the branches the numbers of pores, and especially of dactylopores, diminish. Spines

are numerous on all sides of the terminal branches, but disappear gradually on the posterior and anterior sides of the branches towards the central parts of the flabellum, although they are present along the sides of the meshes in older parts of the colony. Surface of the coenosteum vermiculated, without nematophores. Gastrostyle pine-cone shaped with bristling spines. Dactylostyles wanting. Dactylozooids monomorphic, gastropolyps with four to six rudimentary tentacles.

Conopora pauciseptata n.sp.

(Pl. IV, figs. 1, 2)

St. 2493. 42° 03'9" S, 00° 03'5" E, 472 m.

Only a single fragment of a colony (Pl. IV, figs. 1, 2) was found in the catch. The main stem is 23 mm. high with a basal greater diameter of 6 mm. Only the basal parts of broken side branches have remained; their arrangement and construction show that the ramification has been in one main plane, and the stem and branches of the fan exhibit a distinct anterior side with numerous cyclo systems in one main row, whereas the posterior side is devoid of cyclo systems. On the other hand, the stem and branches also have lateral rows of cyclo systems along both sides towards the anterior side.

The surface of the coenosteum exhibits a peculiar vermiculated or striated structure, which is conspicuous before cleaning with sodium hypochlorite, and which is reminiscent of a finger-print, the same structure observed in *Errinopsis reticulum* (see Pl. III, fig. 2), but even more conspicuous in the present species. The finer lines are caused by rows of microscopic pores in the coenosteum through which the surface epithelium communicates with the tissues of the intersecting canals of the stem and branches.

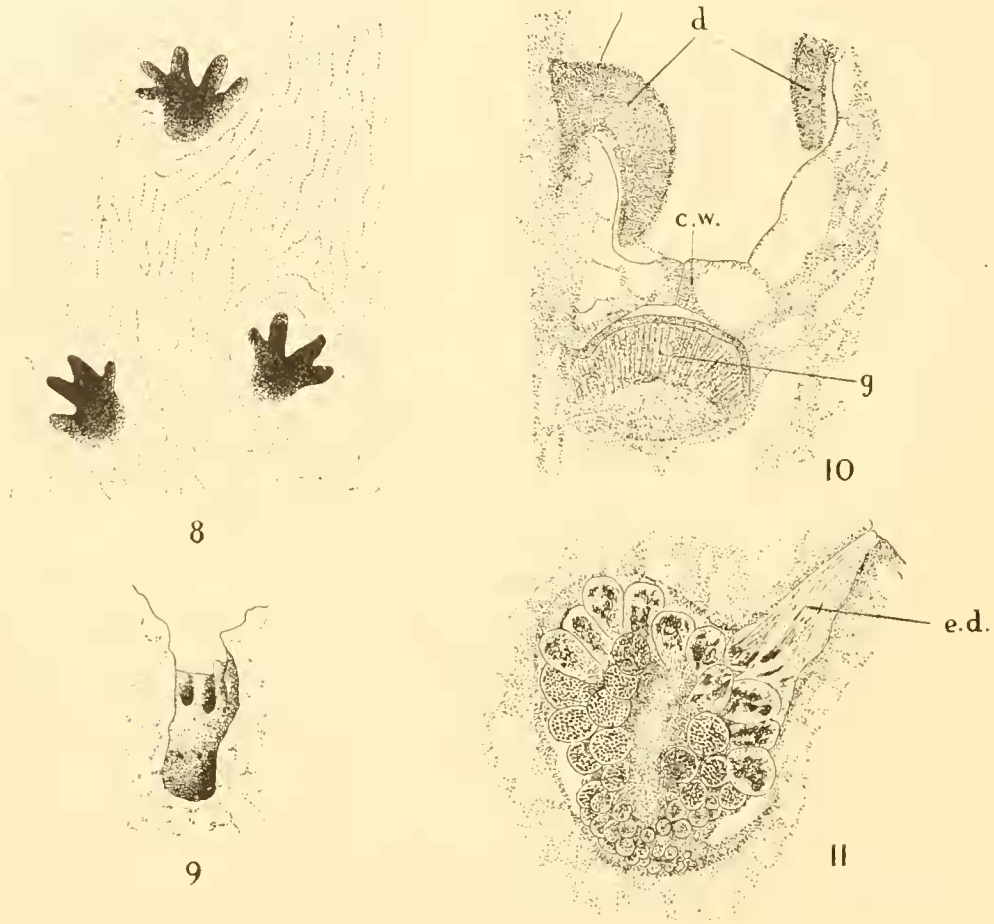
The coenosteum is not so hard as in most *Stylaster* species, but is softer and more easily ground, and although it is not so porous as in the species of *Conopora* previously investigated it compares well with their somewhat more compact construction. The fragment shows no indications of symbiotic worms, but this may be fortuitous. The dimensions indicate that the fragment comes from an old and rather large colony, and one might at all events have expected to find traces of the said symbiosis. This is the second *Conopora* colony observed without symbiotic worms, and it is of interest to note that the ramification and general flabellate shape of the two colonies agree (Broch, 1942, p. 88, pl. xiii, fig. 37a), although they evidently represent different species.

The *cyclo systems* of the median, anterior row of the stem and branches have on the whole many fewer dactylo pores than the lateral systems. The accompanying table gives a variation from 3 to 6 (average 4.5) in the anterior row, whereas the lateral rows show a variation from 5 to 11 dactylo pores (average 8.1).

Numbers of dactylo pores	...	3	4	5	6	7	8	9	10	11	Total
Anterior row		2	4	4	2	—	—	—	—	—	12
Lateral rows		—	—	1	2	6	11	6	2	2	30

Complete cyclo systems occur apically on the branchlets; otherwise a single, complete system may quite exceptionally be found on the lateral rows. Generally, however, a diastemma is developed at the upper (adcauline) side (Fig. 8). It is not possible to state with certainty whether this diastemma exists from the beginning. But its mode of distribution in the different cyclo systems indicates that a diastemma is caused by and developed during growth of the coenosteum (the colony), and that the growth of the coenosteum gradually obliterates the adcauline dactylo pores, whereas the abcauline side of the cyclo system remains unaltered. In this way the number of dactylo pores will also diminish, a fact consistent with conditions in the Discovery colony fragment.

These characteristics obviously differ from those species of *Conopora* previously described. In the latter the cyclosystems are complete and regular, although one (or two) of the adcauline 'teeth' between the dactylopores in *C. major* (Hickson & England, 1905) tend to develop more strongly than the others, thereby linking the genus *Conopora* to *Crypthelia* (Broch, 1936, 1947). This, however, is fundamentally different from the present case, where some of the adcauline dactylopores evidently disappear, whereas no indication of a 'tongue' can be traced, which might be parallelized with the tooth of *Conopora major* or the lid of *Crypthelia*.



Figs. 8-11. *Conopora pauciseptata* from St. 2493. (8) Part of the anterior side of the stem with two cyclosystems of the median row and one 'displaced' (lower left) at the basis of a branch. (9) Gastropore in side view from a ground section; dactylotomes and lower openings of the dactylopores visible. (10) Median section through the cyclosystem of a decalcified specimen. *d*, dactylozooids; *c.w.* wall epithelium of the chamber wall closing over the gastropolyp, *g*. (11) Section through a male ampulla with its efferent duct, *e.d.* (8) and (9) $\times 20$; (10) and (11) $\times 60$.

A comparison of the cyclosystems of the Discovery fragment with those of the previously known *Conopora* species furthermore reveals that the numbers of dactylopores are remarkably reduced. In *C. tennis*, Moseley (1878; Broch, 1936, p. 87) found in 128 cyclosystems an average of 15.45 dactylopores (variation from 12 to 19), and in *C. major* in 72 systems 13.22 dactylopores (variation from 9 to 16). In the Discovery species the table (p. 41) shows a total variation in the present fragment (42 systems counted) from 3 to 11, with an average of 7.07 only. The fragment thus occupies an extreme position as to numbers of dactylopores in the cyclosystems.

The diameters of the cyclosystems generally measure some 0.6-0.8 mm. In terminal branchlets the

cyclo systems are evidently larger, and their diameter may here (in complete systems) attain a length of about 1.1 mm.

The *gastropore* is fairly deep and so arched that the lower part of its longitudinal axis is almost parallel to the axis of the stem or branch. The upper part of the pore is feebly narrower than the lower. The lower apertures of the dactylopores are found as minute round pores just beneath the feeble ledge limiting the 'basal chamber' from the narrower, funnel-shaped distal part of the gastropore. No sphincter is developed between the two compartments.

The *dactylopores* have large distal and small basal apertures. A great dactylo tome, about half as long as the wall of the outer compartment of the gastropore, connects the dactylo pore distally with the gastropore (see Fig. 9).

Ampullae are not visible externally on the fragment.

A small piece of the specimen was sacrificed for examination of the soft parts.

The surface of the colony is equipped with numerous small nematophores which appear as round spots. Under the microscope a mass of large stinging capsules is seen, larger and obviously different from the small capsules of the dactylozooids. Fixation of the material, however, is not good enough to allow of closer examination of the types of capsule.

The polyps are of course contracted (Fig. 10). The *gastrozooids* are globular with no trace of tentacles. The epithelium of the wall of the lower gastropore chamber can close sack-like over the contracted zooid (Fig. 10, *c.w.*), and at the same time the large, finger-shaped *dactylozooids* are doubled down, their tips in many cases reaching to the closed sack. The adnate basal part of the dactylozooid is comparatively small, being only a little broader than the basal breadth of the zooid.

The fragment is from a *male* colony. The ampullae are completely embedded although placed near the surface of the stem and branches. They are furnished with a well-developed efferent duct (Fig. 11, *e.d.*), which in most cases opens into the outer part of the cyclo system funnel, a little outside (above) the dactylozooids. The ducts may open anywhere on the surface of the colony.

Owing to the scanty material only one series of rather thick sections in celloidin was examined. Details of the gonophores can therefore not be given. The ampulla contains one large 'blastostyle' carrying a great number of small gonophores (Fig. 11); the apical gonophores, placed next to the efferent duct of the ampulla, have ripe spermia, whereas the basal ones are as yet only quite rudimentary buds. The production of gonophores evidently continues for some time, spent gonophores being successively replaced from the basal part.

The present specimen diverges strongly from *C. tenuis* and *C. major*, but is definitely more closely related to *C. dura* (Hickson & England, 1908). However, the description and drawings of the last-named species reveal differences, which do not indicate specific identity. Both species have numerous small nematophores on the surface of the colony; but in *C. dura* the authors say that the nematophores have 'slightly raised lips', and such lips are wanting in the Discovery fragment. The surface of *C. dura* is characterized as 'smooth' (in the drawing it seems punctuated), whereas the Discovery specimen has an obviously and peculiarly vermiculated surface.

In the cyclo systems we find that those in *C. dura* are 'irregularly distributed on all sides of the branches and main stem', whereas the present colony has a naked posterior side and the cyclo systems arranged in rather distinct rows laterally and anteriorly. Although the shape of the cyclo systems in *C. dura* is characterized as 'irregular', the drawings show that they are complete without any diastemma in the dactylozooid circle. The drawings also indicate that the mouth of the cyclo system in *C. dura* projects a little over the surface of the coenosteum. These are differences which distinguish *dura* from the Discovery specimen, which also has no horizontal septum between the upper and lower chambers of the gastropore, the limit being only feebly emphasized by a rudimentary ledge, on the lower side

of which a row of small pores occurs, through which the gastropore and the lower part of the dactylopores communicate.

Although at present the full range of variation in the species of the genus *Conopora* is not known, it seems most probable that the specimen from the Discovery material represents a hitherto undescribed species, the features of which may be summed up as follows:

Conopora pauciseptata n.sp.

Colony flabellate (?). Stem and main branches with cyclo systems in three main rows along the anterior and lateral sides. Surface vermiculated, with numerous small nematophores. Cyclo systems complete only terminally on branchlets, elsewhere embedded and incomplete, with an adcauline diastemma in the dactylopore circle. Gastropore with a feebly broader lower chamber separated from the funnel-shaped narrower upper chamber by a circlet of small pores, through which the dactylopores communicate with the gastropore. Dactylotomes about half as long as the wall of the upper gastropore chamber. Dactylopores in the (incomplete) cyclo systems of stem and branches number 3 to 11 (average about 7.07).

ZOOGEOGRAPHICAL REMARKS

Up to the present species of the genus *Errina* have only been reported from antarctic and sub-antarctic (antiboreal) waters. The Discovery Expedition has added one species of a closely related genus, *Errinopsis*. It is of interest at this point to review the antarctic and sub-antarctic data as a whole and in connexion with the comparatively rich Discovery collections, and to compare them with data from other regions.

According to our recent knowledge (Broch, 1942) the genus *Errina* must be regarded zoogeographically as a southern genus, the overwhelming majority of specimens deriving from sub-antarctic waters, and it seems reasonable to assume that the genus must have originated in this region.

It is very difficult to determine the species of this genus. Their distinguishing characteristics are in many cases seemingly of minor importance, and Hickson (1912), moreover, observed great variation in his comparatively abundant collections of the species *E. novae-zealandiae*, which he accordingly split into several 'facies'. However, like previous investigators of Stylasteridae, Hickson did not take into account those subtle characters which have proved to be of the greatest importance as a specific *fundamentum divisionis* in several cases, and his 'facies' seem to be more in the nature of casual growth forms of colonies, probably caused by ecological conditions.

It is accordingly of interest to note that the 'small' characteristics of the species *E. antarctica* are obviously stable. Colonies, the surfaces of which have in places been more strongly eroded, may at first give an aberrant impression. However, branch ends intact with undisturbed surface and intact spines exhibit all the typical characters and do away with every doubt as to specific identity.

E. antarctica is characteristic of the antarctic and sub-antarctic regions (Fig. 12). According to Ridley (1881) the northernmost find and the type locality was made by the *Alert* expedition in the Trinidad Channel (Madre-de-Dios archipelago in south-west Chili, about 50° S) at only 45 fathoms depth, still the shallowest locality recorded.

The species is remarkably eurybathic. According to present data it is found at depths of some 500 m. (the two deepest Discovery hauls of *E. antarctica* were from St. 1948, 490-610 m., and St. 2200, 532-512 m.). The *Belgica* expedition brought home some specimens of a Stylasterid recorded by von Marenzeller (1903) as *E. gracilis*, which, as stated above, must be regarded as a synonym of *E. antarctica*. Von Marenzeller did not give the exact depths of the four localities south-east of Peter I Island, whereas Hickson (1912) says that the depth 'is probably between 500 and 600 metres'. I am

indebted to the director of Institut Royal des Sciences Naturelles de Belgique, Dr V. van Straelen, for the exact data concerning these localities:

12. v. 1898, $71^{\circ} 14' S$, $89^{\circ} 14' W$, depth 450 m.
 18. v. 1898, $71^{\circ} 18' S$, $88^{\circ} 02' W$, depth 450 m.
 27. v. 1898, $71^{\circ} 15' S$, $87^{\circ} 39' W$, depth 100 m.
 28. v. 1898, $71^{\circ} 19' S$, $87^{\circ} 37' W$, depth 435 m.

These data are of great interest combined with the localities from the Discovery collections.

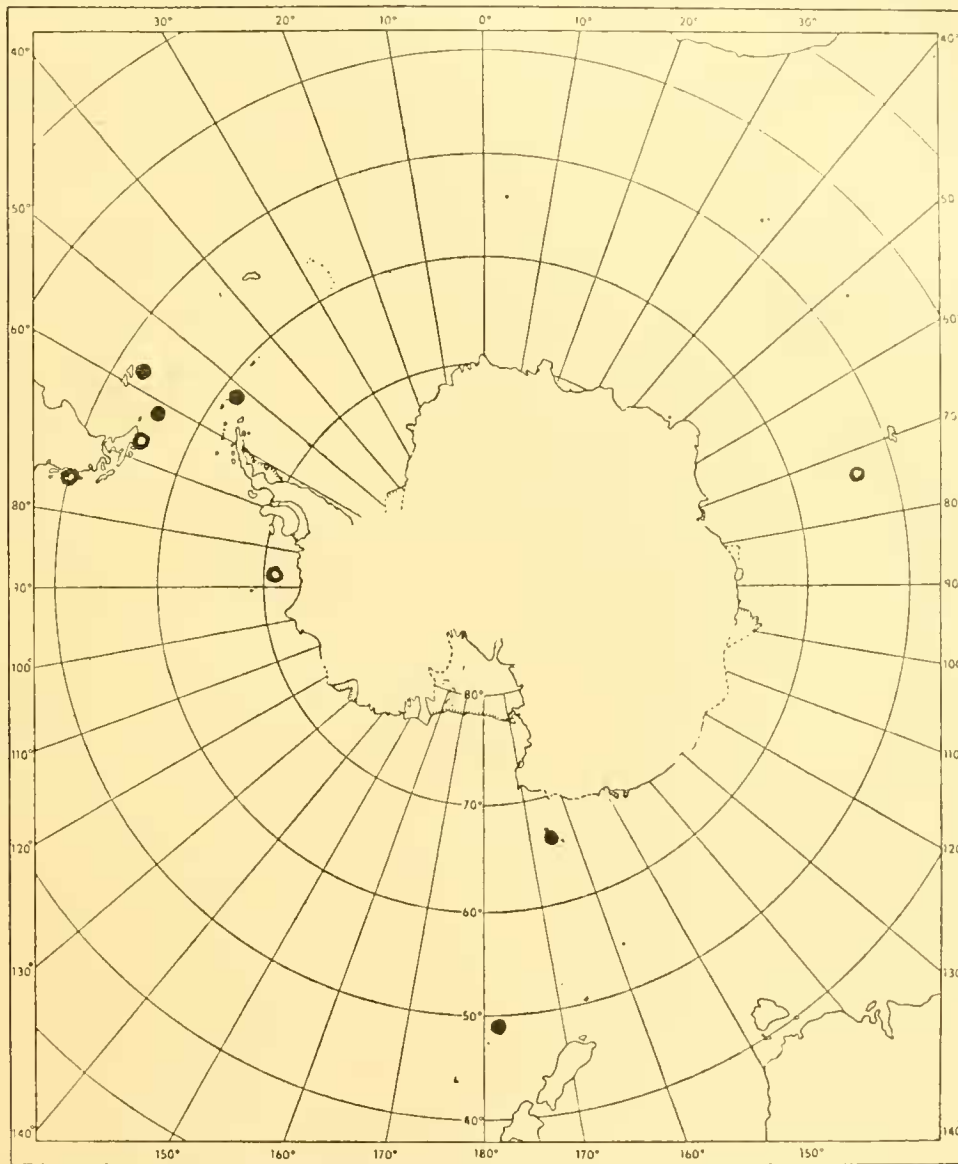


Fig. 12. The localities of *Errina antarctica*. Earlier known localities, open rings.

All localities with depths greater than 400 m. are situated south of the Antarctic Convergence; in sub-antarctic waters, on the other hand, the species has as yet only been met with at depths above 200 m. It must be mentioned here that no depth record exists concerning the two older localities, Cape Horn and Heard Island.

A series of new localities has been added by the Discovery Expedition (see Fig. 12). Allowing for the difficulties attendant on taking Stylasterids in the catches because of their special ecological demands,

we can infer from the chart that the species probably has circumpolar distribution. None of the finds is located north of the Sub-tropical Convergence, which probably indicates the extreme limit of the habitat. The data are at present very scanty, and the deductions may appear a little hypothetical. But we can with certainty maintain that *E. antarctica* is a characteristic sub-antarctic and antarctic species, probably also circumpolar.

According to data from the Norwegian *Bratlegg* expedition in 1947-8, *E. antarctica* is comparatively common on the Burdwood Bank. The Burdwood Bank is also the home of another species of the genus, *E. spongiosa* Broch (1942), which was found by the Swedish Antarctic Expedition 1900-1 at a depth of 137-150 m. No other locality having been discovered as yet, the zoogeographical character of the species is somewhat uncertain; presumably, however, the species is endemic.

A third species of the genus, *E. moseleyi* Ridley (1881), at all events borders on the sub-antarctic region. It was also found by the *Alert* Expedition in the Madre-de-Dios Archipelago, but only in shallow water between 2 and 10 fathoms. Further details concerning this species are wanting.

Zoogeographically the Burdwood Bank and the Falkland Islands belong to the same sub-region as the southernmost coastal waters of South America. Besides the two *Errina* species, *Errinopsis reticulum* also appears to have its home in these waters, and it is therefore reasonable to maintain that according to our present data *Errina antarctica*, *E. spongiosa* and *Errinopsis reticulum* are endemic species of the sub-antarctic (antiboreal) regions. *Errina antarctica* also penetrates into the high-antarctic region and appears to be as numerous here as in the sub-antarctic region.

The collections also contain one representative of the sub-family Stylasteriinae, viz. *Conopora pauciseptata*, from St. 2493, position 42° 03' 9" S, 00° 03' 5" E, south of the Sub-tropical Convergence. The genus *Conopora* has previously only been found in the Indian and Pacific Oceans (Broch, 1942, p. 67, fig. 21), but must now also be added to the Atlantic fauna.

C. pauciseptata is recorded from parts of the oceans, where the bottom fauna has only been scantily explored in spite of its special interest. In benthic regions it is a problem where to draw the limit between sub-antarctic (anti-boreal) and sub-tropical areas, not only in South African and New Zealand waters but also along the coasts of South America, where the coastal shallow-water fauna has also been too insufficiently explored to allow of well-founded zoogeographical deductions. The locality at which *Conopora* was found indicates that it may be an inhabitant of the sub-tropical benthic regions.

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